

CLAIMS

What is claimed is:

1. Graphics processing circuitry for a medical ultrasound system, the graphics processing circuitry comprising:

a graphics processing unit;

a system interface coupled to the graphics processing unit; and

a graphics memory coupled to the graphics processing unit, the graphics memory comprising:

an image data block storing image data entries for at least one ultrasound beam,

a vertex data block storing vertex entries that define rendering shapes;

and

rendering plane definitions,

where the graphics processing unit accesses the image data entries and vertex entries to render a volume according to the rendering plane definitions with blending parameters for selected image data entries and where the graphics processing unit renders the volume using alpha blending in accordance with the blending parameters.

2. The graphics processing circuitry of claim 1, where the graphics memory further comprises the graphics processing unit rendering the volume from back to front.

3. The graphics processing circuitry of claim 2, where the blending parameters are stored in the image data block.

4. The graphics processing circuitry of claim 2, where the blending parameters are stored in a look up table that maps sample values to blending parameters.
5. The graphics processing circuitry of claim 2, where the blending parameters are transparency values.
6. The graphics processing circuitry of claim 2, where the image data block stores a first dataset of image data entries for a plurality of ultrasound beams of a first type, and a second dataset of image data entries for a plurality of ultrasound beams of a second type, and wherein at least one of the vertex entries specifies a vertex spatial position, a texture pointer into the first data set, and a texture pointer into the second dataset.
7. The graphics processing circuitry of claim 6, where at least one of the first type and second type is colorflow.
8. The graphics processing circuitry of claim 6, where at least one of the first type and second type is B-mode.
9. The graphics processing circuitry of claim 6, where at least one of the first and second types is local image gradients.
10. The graphics processing circuitry of claim 9, further comprising a light source definition stored in the graphics memory.
11. The graphics processing circuitry of claim 1, where the vertex data block has a first set of vertex entries that define the rendering plane definitions and a second set of vertex entries specifies an anatomical model where the graphics processing unit accesses image data entries and the first set of vertex entries to render a volume

according to the rendering plane definitions with blending parameters for the selected image data entries and the second set of vertex entries to render the anatomical model.

12. The graphics processing circuitry of claim 11, where the anatomical model is a pre-generate model of anatomical structure present in the volume to be rendered.

13. The graphics processing circuitry of claim 1, where the rendering shapes are triangles.

14. The graphics processing circuitry of claim 1, where the rendering shapes are triangles and where the vertex entries define at least one triangle strip.

15. The graphics processing circuitry of claim 1, where the graphics processing unit accesses the image data entries and vertex entries to render a volume absent an at least one cut away plane.

16. A medical ultrasound imaging system comprising:

an image sensor for obtaining image data from a volume of a region of interest;

a first memory;

a signal processor coupled to the image sensor and the first memory for receiving the image data and storing the image data in the first memory;

graphics processing circuitry comprising:

a graphics processing unit; and

a graphics memory coupled to the graphics processing unit,

where the signal processor stores image data entries for at least one ultrasound beam in a data block in the graphics memory, stores vertex entries that

define blending shapes in a vertex data block in the graphics memory, and initiates rendering of the volume according to a plurality of rendering planes.

17. The medical ultrasound imaging system of claim 16, where the graphics processing unit blends the volume according to the rendering planes from back to front.

18. The medical ultrasound imaging system of claim 17, where the graphics processing unit blends the volume using alpha-blending.

19. The medical ultrasound imaging system of claim 16, where the signal processor stores, in the image data block, a first dataset of image data entries for a plurality of ultrasound beams of a first type, and a second dataset of image data entries for a plurality of ultrasound beams of a second type, and wherein at least one of the vertex entries specifies a vertex spatial position, a texture pointer into the first data set, and a texture pointer into the second dataset.

20. The medical ultrasound imaging system of claim 19, where at least one of the first type and second type is one of color flow data, tissue velocity data or data derived from tissue velocity data.

21. The medical ultrasound imaging system of claim 19, where at least one of the first type and second type is B-mode.

22. The medical ultrasound imaging system of claim 19, where at least one of the first and second types is local image gradients.

23. The medical ultrasound imaging system of claim 22, further comprising a light source definition stored in the graphics memory.

24. The medical ultrasound imaging system of claim 16, where the signal processor stores, in the image data block, a first set of vertex entries that define rendering plane definitions and a second set of vertex entries specifies an anatomical model where the signal processor accesses the image data entries and the first set of vertex entries to render the volume according to the plurality of rendering planes with blending shapes for selected image data entries and the second set of vertex entries to render the anatomical model.

25. In a medical ultrasound imaging system, a method for rendering a volume, the method comprising the steps of:

obtaining image components for a volume of a region of interest;

transferring a dataset of image data for the image components into an image data block;

transferring vertex entries for the image components into a vertex data block;

transferring vertex index sets defining rendering planes into a vertex data index; and

initiating volume rendering of the dataset by a graphics processing unit by blending the rendering planes.

26. The method of claim 25, where the step of initiating comprises the step of initiating front to back volume rendering using alpha blending.

27. The method of claim 25, further comprising the step of storing blending parameters in memory for the graphics processing unit.

28. The method of claim 27, where the step of storing blending parameters comprises the step of storing transparency values with the dataset.

29. The method of claim 27, where the step of storing blending parameters comprises the step of storing a transparency lookup table in the memory for the graphics processing unit.

30. The method of claim 25, where the step of transferring vertex entries comprises the step of transferring vertex entries comprising a vertex spatial position and a texture pointer into the dataset.

31. The method of claim 25, where the step of transferring the dataset comprises the steps of:

transferring a first dataset of image data entries for a plurality of ultrasound beams of a first type; and

transferring a second dataset of image data entries for a plurality of ultrasound beams of a second type.

32. The method of claim 31, where the step of transferring vertex entries comprises the step of transferring vertex entries comprising a vertex spatial position, a texture pointer into the first data set, and a texture pointer into the second dataset.

33. The method of claim 31, where at least one of the first type and second type is colorflow.

34. The method of claim 31, where at least one of the first type and second type is B-mode.

35. The method of claim 31, where at least one of the first and second types is local image gradients.

36. The method of claim 25, where the step of transferring the dataset comprises the steps of:

transferring a first dataset of image data entries for a plurality of ultrasound beams of a first type; and

transferring a second dataset of image data entries for an anatomical model.

37. The method of claim 36, where the step of initiating comprises the step of initiating volume rendering of a volume including the anatomical model.

38. The method of claim 37, where the step of initiating comprises the step of initiating alpha blending volume rendering of the volume.